ganic beings; for example, whether the Connecticut birds were contemporary with the Saurians of the Jurassic or the Labyrinthodonts of the Triassic series; while he would reply to the first question, that the birds existed so many *periods* previously to the historic era.

4. *Man did not appear upon the globe until a very late epoch of the Alluvial period, and geology cannot point out a single example of an animal introduced later than man.* It was fitting that the monarch of the animal kingdom should be introduced into a world whose valleys, plains, and rivers had been already inhabited by successive economies of life, yet all inferior to himself. Many excellent men have been troubled by the apparent collisions between science and the Bible; but so long as the conclusions of geology are as harmonious with the sacred record of the creation as in the present instance, they need not fear. The Pentateuch represents man as the latest born of organisms, so does geology; but the Pentateuch does not say that the Post Pliocene animals all became extinct before his creation, as many authors seem to have inferred.

ART. IX. — *A Treatise on Hygiene, with special Reference to the Military Service.* By WILLIAM A. HAMMOND, M. D., Surgeon-General U. S. Army. Philadelphia: J. B. Lippincott & Co. 1863. 8vo. pp. 596.

WHEN some future historian shall narrate the cruel tale of the great civil war in America, among the scenes of horror and suffering which always go to make up that "sum of all evils" there will be found to soften his theme many incidents, not only of heroism and patriotism, but also of humanity advanced, of the welfare of the sick and wounded promoted, and of knowledge in the sacred art of healing enlarged. The reviewer of these fields will see, not only battles and slaughter, imprisonment and want, but the divine offices of benevolence performed by hundreds of self-sacrificing men of all ages; the sick and wounded tended in gigantic hospitals, where modern

science, hygiene, and personal devotion have combined to build and administer sick-wards more commodious and more wholesome than have ever been erected in time of war before. Certainly, while we should humble ourselves over our sins of intolerance, arrogance, and Pharisaism, which have rendered the causes of this unnatural contest to some degree mutual, both North and South, we may claim some reason for expiation, not alone in the sacrifices of dear lives which we have lost, but in our successful efforts to heal and comfort those who have offered their bodies to wounds and to malaria for our sake.

It is with such feelings that we welcome the book before us, and that we hope to study it, in a brief review, with both interest and profit to our readers. We should naturally, also, be disposed to receive with kindly criticism one who has stolen from his moments of repose, in the midst of arduous executive duties, the time and labor to compile a treatise on Hygiene for his brother-workers. The Surgeon-General best explains for himself, in his Preface, the reasons which urged him to issue this book: —

"If I had not believed that a great necessity existed for a treatise upon some of the principal subjects of hygiene, I certainly should not, in addition to my onerous public duties, have undertaken the task of preparing the present volume. That a growing attention to the subject of sanitary science is being manifested, cannot be doubted. The most intelligent members of the medical profession recognize the principle, that their efforts should be directed more especially to the prevention of disease than to its cure; and the people, who are rarely slow to comprehend matters which it is to their advantage to know, are beginning to appreciate the same fact. . . . . The nation had entered upon a war for the preservation of its liberties, the most gigantic ever undertaken in the history of the world. Hundreds of thousands, from the boy to the old man, had devoted themselves to the service of their country, — men, whose value to the State could not be estimated, and upon whom its future greatness, both in war and peace, in a great measure depended. Thousands of physicians had been found to take the medical charge of the armies created, — many of them well known for their professional eminence, and others, by far the greater number, young and inexperienced, though not lacking the will and the ability to do their whole duty, when that duty was pointed out to them. . . . . In

the military service, more than any other, a knowledge of the means of preventing disease and of facilitating recovery by methods other than the mere administration of drugs, is necessary. Armies are often so situated that their salvation depends upon the knowledge which the medical officer may possess; and it never happens that some important application of hygienic principles cannot be made to them by those who are charged with their medical superintendence. But though many excellent treatises upon individual hygiene are to be met with in the French and German languages, there is not one to be found in the English tongue..... There was no work, then, to which I could refer those who came to me for information which I had no time to give them as fully as was desirable; and as I had for several years given a large portion of my leisure to the study of hygiene, — rather, however, in a desultory way than with any systematic objects in view, — I concluded to devote the hours which would otherwise have been passed in rest, in preparing a volume upon the more important subjects belonging to the science of hygiene, especially those which have a bearing upon the military service." — pp. vii. – ix.

This work is from the press of Lippincott & Co. of Philadelphia, and the reader owes them his thanks for the fair paper, and the large type in which it is printed. The general execution of the book is excellent. Seventy-four illustrations enliven its pages. The diagrams, ground-plans, and elevations of various hospitals leave nothing to be desired; and altogether it is issued in a style to do credit to the originality and worth of its contents.

In his general order of subjects, the author treats, first, of the examination of recruits; secondly, of agents *inherent* in the organism which affect the hygienic condition of man, such as race, temperament, idiosyncrasy, age, sex, hereditary tendencies, habits, and constitution; thirdly, of agents *external* to the organism which act upon the health of man, such as the atmosphere, temperature, light, electricity, water, soil, climate, and acclimation. A large space is next devoted to hospitals; and, finally, barracks, camps, food, and clothing are treated of at considerable length.

It is obviously impossible, in a short review, to examine all these subjects in detail. We propose, therefore, to devote a few pages to the more important of the "external agents," and then to give our main attention to the subject of hospitals,

both on account of the paramount importance of this subject to the soldier and the country, and because Dr. Hammond evidently regards it as we do, since he has devoted one fourth of his space to hospitals alone. We may venture to speak of them, also, to some degree *ex cathedra*, having been connected in a surgical capacity with a military hospital in Washington, and having resided in it several months. It is our hope to correct, from the recollections of our personal experience, some misconceptions which have prevailed about the abuses of hospitals. At the same time, we shall not hesitate to speak freely of the faults which exist.

In his chapter on the examination of recruits, Dr. Hammond is necessarily less full than the very complete "Manual for the Recruiting Service" of Surgeon Tripler. On some points, however, as the various means of measuring the chest and estimating the vital capacity, he is very minute. We are glad to see him take strong grounds against the suicidal policy of raising an army on paper, by the careless examination of recruits. A weak, malformed, or sickly soldier, he says, is not only useless, but a positive encumbrance. Not only is he incapable of performing the duty required of him, but his frequent attacks of indisposition demand the services of others in taking care of him, and add to the immobility which attends all armies. Thousands of incapacitated men were, in the early stages of the war, allowed to enter the army, to be discharged after a few weeks' service, most of which had been passed in the hospital. Many did not march five miles before breaking down, and not a few never shouldered a musket at all. In a hospital of six hundred beds were discovered, at one time, fifty-two cases of inguinal hernia, in men who had undergone very little hardship. In several regiments medical inspection was performed by the surgeon walking down the line, and looking at the men as they stood in the ranks.

Again, as to the age of recruits, our author speaks of seeing a boy of fifteen, enlisted as a drummer, but placed in the ranks, and made to carry the entire equipment of a soldier, until he succumbed, broken down for life. We can add to this our testimony, having had in the first ward placed under our care three soldier-boys, under sixteen, ruined with hernia, rheumatic carditis, typhoid prostration, and "weak back."

On the subject of race, Dr. Hammond says of the negro: —

"So far as his mental and physical characteristics are concerned, it is very doubtful if any positive advance has been made by transferring him to civilization. The negro of unmixed blood presents the same prognathous skull, the facial angle of which measures from 70° to 75°; the same short, coarse, frizzled hair; the same dark skin and cast of features. The arms are long, the lower limbs crooked, the calf meagre, the os calcis prolonged posteriorly, and the foot lacking the high arch which characterizes this member in the European. It is not to be denied, however, that the negro is capable of considerable intellectual and physical development, though it seems, nevertheless, that he is altogether incapable of attaining to the highest point in either. By transferring him to a temperate climate, he has positively lost rank physically. The proper place to make the experiment of civilization with him is in the climate under which he has lived for thousands of years." — p. 69.

The experiment of making a soldier of him must be considered as not yet completely decided. By the statistics of British troops in the West Indies, colored and European, it appears that the negro soldier enjoys a remarkable immunity from malarial diseases, but is much more subject to phthisis than the white. To do the rough field-work of intrenching under a tropical sun, and to garrison military posts in malarious regions, he is obviously well adapted.

On the important subject of air, our attention is called to a new fact, or result of experiment, concerning carbonic acid. We had supposed that this gas was so heavy, that the greatest portion of it in the respired air of an apartment would always be found near the floor. But it appears that Leblanc has proved that the air of the Opera Comique, after a performance, contained more than four per cent of carbonic acid in the upper part of the room, and about two per cent in the lower part. This peculiarity was due mainly to the upward current of a ventilating flue over the chandelier. Other experiments were not entirely confirmatory of this. But by the law of the diffusion of gases, a very extensive interchange must take place, though slowly. Dr. Hammond found the *organic matters* given off by the skin and lungs most abundant in the upper strata of a room.

He leans to that theory of malaria which ascribes it to the spores of minute fungi floating in the air, rather than to the old view of its production by the gaseous products of decomposing vegetation. There are certainly many plausible arguments in favor of this theory. The recent discovery by Dr. Salisbury of a fungus upon wheat straw, by inoculating with which a disease like measles is produced, and the singular fact that large portions of whole regiments, which left home well and sound, were simultaneously affected by measles, seem to establish some connection of cause and effect. Good water, next to air, is the most important essential to the soldier. No doubt exists that malaria is conveyed by drinking-water, and that McClellan's army on the Chickahominy suffered severely from this cause. The water of the Western rivers always causes a new accession of diarrhœa among old residents after a freshet, when mud and organic matters are kept in suspension by the current, and have not had time to settle. Water may be either so full of saline matters as to keep up a constant derangement of the bowels; or, if stagnant, and containing organic impurities, it gives rise to putrid fever. Very interesting details of microscopical and chemical analysis, and of means of purification and filtration, are given at length; and the great importance of bathing to the soldier is forcibly insisted on.

We are far, however, from being able to assent to the crude pathological *dictum* of our author, that "the habitual use of ice-cold water, so prevalent among all classes in this country, is calculated to injure the tone of the stomach, and *to produce diptheria*"! It is a matter of regret that hasty expressions of such a nature, without the support of any data save bare assertion, should have crept into a work which is otherwise valuable, and scientific in tone.

It is especially necessary, says our author, that the utmost care should be taken to secure every hygienic advantage in the location and construction of hospitals. Unlike other habitations, — except prisons, — the inmates are incapable of going out to obtain fresh air and light. They must submit to the conditions in which they are placed, and if these are bad in a sanitary point of view, the evil falls upon them with much

greater force than upon those able-bodied persons who, though they may reside in insalubrious habitations, are within their walls for but a small portion of the day. Moreover, in hospitals numbers of sick persons — sometimes several hundreds, or even thousands — are brought together, affected with every imaginable disease and injury, and often with their bodies and clothing contaminated with excretions and filth, which have accumulated through their neglect of the simplest habits of cleanliness; and thus influences are at work tending still further to modify unfavorably the pathological conditions in which the inmates are placed.

The choice of a location is of prime importance. An elevated situation, a dry soil, accessible and pure water, free and open surroundings, away from the heart of cities, should, of course, be preferred. The neighborhood of bodies of fresh water, or of manufactories, is to be avoided. Permanent hospitals should be of stone; temporary ones, of wood, — the walls of hard-finished plaster; the floors of oak, and the entries of tiles, or stone.

"In constructing and administering a hospital, certain principles are to be observed: —

1st. That it is capable of being well ventilated.

2d. That it is capacious enough for the number of inmates it is to contain.

3d. That it admits of good drainage.

4th. That it is provided with a sufficient number of windows.

5th. That the kitchen, laundry, and offices are well arranged, and of ample size.

6th. That efficient water-closet, ablution, and bathing accommodations are provided.

7th. That it is amply supplied with water, and gas or other means of illumination.

8th. That the furniture of all kinds is of suitable quality.

9th. That the officers and attendants have their proper respective duties assigned to them, and that they are in number sufficient for the wants of the sick.

10th. That proper rules are established for the government of the hospital, for the diet of the inmates, and for preserving order, and an efficient state of police." — p. 310.

Reduced to its simplest form, a hospital consists of two parts,

the ward and the administration. The sick are to be entirely separated from the administrative part of the building. In fact, they are to have a house, or series of houses, by themselves. A collection of such buildings constitutes the hospital. The wards are grouped around the administrative department as a nucleus. No other arrangement than that which entirely separates the wards from one another is worthy of consideration. This plan consists in having distinct buildings for each ward, connected by airy corridors, and is called the pavilion system. To show how far public opinion has changed about the construction and ventilation of hospitals, we will quote a brief description of a military sanitarium in the war of 1812.

"Dr. Tilton, Surgeon-General, with a mind possessing correct principles of philosophy, ... suggested hospitals upon a novel plan. They are built one story in height, with round logs, having a fireplace or hearth in the centre, without a chimney, the smoke ventilated through an inverted wooden funnel affixed to an opening in the roof, — the floors of the rooms earth, in the true aboriginal style. He thinks them an improvement as they respect health. . . . . Wooden floors retain infectious principles, while earth floors absorb or neutralize them. . . . . It would be difficult to devise a more objectionable plan for hospitals than that proposed by Surgeon-General Tilton. A ground floor is, of all others, the worst, for the very reason that it absorbs readily the organic matters given off from the bodies of the inmates." — pp. 358, 359.

In another plan which is given, the wards open upon a close corridor, thus effectually preventing ventilation. Equally objectionable features will be found in many of the old hospitals of Europe, as we shall see presently.

Interesting series of experiments to determine the amount of carbonic acid and of organic impurities in the air of bedrooms and of hospital-wards, are given. "I have inspected hospitals," says Dr. Hammond, "where no attention was paid to ventilation; where the fact that dozens of patients affected with typhoid fever, dysentery, and other zymotic diseases, were breathing over and over again the same air, was either unnoticed by the medical officers, or uncared for." No better test of the professional fitness of a surgeon to take the charge of a hospital can be found, than the estimate which he puts upon

the importance of providing an abundance of fresh air for his patients. Where there is perfect ventilation, there is no infection. Contagion can act only in confined air. Erysipelas, pyemia, hospital gangrene, typhus and typhoid fevers, are diseases which are almost unknown among individuals not exposed to the dangers of overcrowding and want of fresh air.

"M. Larrey, in calling attention to this subject, says: 'The danger of infection depends upon the vitiation of the atmosphere, especially during the night. The natural excretions of the sick — the breath, the fetid perspiration, the expectorated matter, the intestinal and urinary evacuations, the suppurations from wounds and ulcers, and sometimes the putridity of mortification or of hospital gangrene — are so many sources of contamination, without counting the odors of medicines, of tisans and poultices, the evaporations from liquids, the emanations from the soil, from the gas or oil used for illumination, from the bed linen, and from the too closely situated or badly constructed latrines.' Lévy is equally emphatic: 'I am far from denying the importance of diet, of curative methods, of careful attention, of an efficient administration, etc.; but all these elements of hospital service are secondary to the necessity for having pure air. Bring them to the highest degree of ideal perfection, and, if the air is vitiated, or if it is deficient in quantity, neither improvement is manifest nor the mortality lessened.'" — pp. 428, 429.

A hospital ward should be of an oblong shape, and of a width of not more than twenty-five feet, which will allow a ten-foot passageway between the beds. There should never be more than two rows of beds, set about nine inches from the wall, and averaging four feet apart. They may be best put in pairs between the windows. Each bed then occupies about seven feet in the length of the ward; consequently a ward of 50 beds, 25 on a side, would be properly $25 \times 7 = 175$ feet long. The height should not be less than fourteen nor more than sixteen feet. A ward, therefore, of these dimensions, 25 (width) $\times$ 175 (length) $\times$ 14 (height) $= 60{,}250$ cubic feet, gives 1,205 cubic feet to each patient. These dimensions, says Dr. Hammond, are the lowest which should be allowed in any permanent hospital. Every patient should receive, as a *minimum* allowance, 1,200 cubic feet of space, about 87 of which should be superficial. If less is allotted to him, an offence is committed against the laws of human health. In temporary,

ridge-ventilated hospitals, where the air is changed often, less space will suffice. The beds may be two feet and a half apart, and the allowance of space about 960 cubic feet. One window, not less than five feet high, should be allowed for every two patients. Indispensable appendages to each ward are a bath and wash room, a water-closet, a ward-master's room, and perhaps a mess-room for convalescents. The bath-room and water-closet should be at the end of the ward farthest from the corridors. The administrative department, in a separate, central building, should contain rooms for a surgery, a hospital office, store-rooms, medical officers' quarters, quarters for hospital stewards, nurses, and apothecaries; also a kitchen, a laundry, and a dead-house. The last three should be, if possible, entirely detached.

A brief retrospect of the faults of older hospitals may be of service. The principal hospitals of Europe, with ground-plans appended, are reviewed and criticised in detail. The favorite plan in former times was to build hospitals around a central courtyard, than which nothing can be more pernicious. Guy's Hospital, London, has its wards around two closed courts, which shut out air and light. The Necker, Paris, also encloses three sides of a square. Another plan, scarcely better, is to crowd the wards together in pairs, or by fours. On this model are constructed the United States Marine Hospitals; also the Hôpital de la Clinique of Paris. Another objectionable plan is to arrange the wards on the sides of a closed corridor, as in Rotterdam, Hamburg, and Bremen. The most extensive military hospital in Great Britain, that at Netley, just completed, is also built on this principle. It is said to have been designed and constructed by the Engineer Corps of the British army, without the advice of the medical department being asked at all. In the King's College Hospital, London, the wards are double, or back to back, so that they can have ventilation from windows on one side only. Equally objectionable is it to build wards of three or more stories in height. They should never exceed two stories. The difficulty and labor of administration are much increased, and too many sick are collected under one roof. Our author thinks that fifty patients are as many as should be congregated in one building. Yet in cities, where

land is dear, it is very common to erect hospitals of three stories.

A perfect hospital has never yet been built, and perhaps never will be. Among those of Europe which are thought best to fulfil the requirements of hygiene, is the Lariboisière of Paris. It is a great advance over the older plans, and is a pavilion hospital, with grass-plots between the pavilions, and a central administrative building. The pavilions have too many stories, and are too close together, shutting off the lower wards from the sun, according to Dr. Hammond. The new military hospital at Vincennes is admirable in many respects, and perhaps the best yet spoken of. The Hospital of St. Louis, at Turin, is built in the form of an ⋈, with the administration in the centre. It has many fine features and is well administered; but the windows of the wards do not open directly to the external air.

Of the civil hospitals of the United States, Dr. Hammond devotes special praise to the new Free City Hospital of Boston, now building in the south part of this city, and to the Episcopal Hospital, Philadelphia. He thinks that they fulfil all the requirements of sanitary science.

The two great principles which govern the erection of the government hospitals at the present time, and which render them so far superior to many older and more permanent institutions, are the segregation of the sick by the system of pavilions, and ventilation by the ridge. Both these sanitary improvements, it should be observed, were first recommended by the commission appointed by Parliament to inquire into the hospitals of the Crimean war, and to report suggestions for reform, and are described and published in one of the Blue-Books. Ventilation is provided for by leaving an opening, ten inches wide, at the ridge, along the whole length of the ward. This opening should be covered by a roof projecting at least two feet on each side, and elevated four inches above the lower roof. A narrow strip, placed along the margins of the opening, guards against the entrance of snow or rain. Holes must be cut in the sides of the ward under the beds, which close with a sliding valve or door. The amount of fresh air admitted is thus easily regulated. This system of

ventilation is very effective. The sun heats the roof, whereby an upward current is established, and the air of the ward is constantly renewed. Such wards are always comparatively cool and fresh. In winter, if it be found impracticable to keep these ventilators open, and sustain the necessary heat, another means is resorted to. The cold air is brought up beneath the stove, inside a double zinc casing, enters the room tempered of its coldness, and finds exit by a flue or shaft of wood, through which runs the stove-funnel, thus establishing an efficient current. The system of ridge ventilation is found well adapted to permanent hospitals. The Episcopal Hospital in Philadelphia is ventilated by discharge-flues, successively expanding in size, until they reach a sort of air-chamber heated by gas-jets, which draws up the impure air and discharges it out of doors. When these methods cannot be adopted, an Arnott's ventilator may be used.

The first pavilion hospital with ridge ventilation in the United States was built at Parkersburg, Virginia. It was planned by Assistant-Surgeon Dunster, U. S. A., from data derived by the Surgeon-General from the Crimean experience. Soon afterward, the Sanitary Commission planned the Judiciary Square Hospital, in Washington. This was built in ten pavilions, with a central corridor and administrative building; but instead of ridge ventilation, it had a series of upper windows in each ward, which swung upon a horizontal pivot. The ventilation here was found to be very effectual, the air at night being undistinguishable from the external atmosphere, and the hospital smell being much less perceptible than in other permanent hospitals. This was in the spring of 1862. Since that time, very many and much larger hospitals have been erected on the ridge and pavilion plan, with marked success. Such are the McLellan Hospital, the Hammond Hospital at Point Lookout, the Lincoln Hospital, Washington, the General Hospital at Fort Schuyler, the West Philadelphia Hospital, and the Mower Hospital. The last being the largest and most complete, as well as recent, we can take it as a perfected type of the others. This hospital is situated at Chestnut Hill, on the outskirts of the city of Philadelphia. It was designed by Assistant-Surgeon Greenleaf, and is the largest hospital in the

world devoted to the reception of the sick and wounded. It contains thirty-three hundred beds, and cost $250,000. It is built of wood, and will last perhaps ten years, without extensive repairs. It is composed of fifty pavilions, projecting off from a corridor of a flattened ellipsoidal form, like the spokes of a wheel. The corridor is sixteen feet wide, and twenty-four hundred long. The area enclosed by it measures seven acres, and is used for air, exercise, and recreation of patients. The administration is in the centre. The sides of the corridor are almost wholly of glass set in sashes, which in summer are removed. In cold weather the corridor is warmed by fifty large stoves, and forms a good place for the convalescents to walk in. The pavilions, being arranged in radii, are twenty feet apart at the corridor, and forty at the distant extremities. The circulation of air around them is thus secured. The pavilions are one hundred and seventy-five feet long by twenty wide, fourteen feet high at the eaves, and nineteen at the ridge. They are supplied with ridge ventilation for the whole length of the pavilion in summer, and with stoves and ventilating flues, as already described, for winter. The length of the ward is one hundred and fifty feet, the remaining twenty-five feet being taken up by a mess-room at one end and a wash-room and ward-master's room at the other. Each ward contains fifty-two beds, allowing nine hundred and fifty cubic feet to each patient. The water-closets are well arranged, with a full stream of water; and the bath-room and ablution-room are supplied with hot and cold water. These are all at the farther extremity of the pavilion. The food is brought to the mess-rooms in hot-water cars running on a railway the whole length of the corridor. By this means the meals are served hot from the kitchen. The railway is also used to transport patients. The kitchen has a large range, two large stoves, and three boilers of sixty gallons each. The laundries are supplied with large caldrons heated by steam, with washing-machines, wringers, and other apparatus. Hot water is furnished by a steam-engine, which forces it over the building. Over one hundred and fifty thousand gallons of water are used daily, an average of fifty gallons to each inmate. The sewerage is efficient, and the whole building is lighted with gas. A mag-

netic telegraph and fire-alarm connect all the wards with the office of the surgeon in charge. The *personnel* of the hospital consists of thirty medical officers, eight hospital stewards, three chaplains, and four hundred and ninety-five nurses, attendants, and cooks. There is also a guard of eighty-six men. The only desideratum in this noble institution is that the wards should be four feet wider.

In lighting and ventilating a hospital, the amount of oxygen consumed and of carbonic acid evolved by the candles or gas is to be considered. Dr. Hammond has found that a gas-burner consuming four feet of gas per hour evolves about five cubic feet of carbonic acid in that time. The Mower Hospital has 1,050 gas-burners, and consumes 178,260 feet of gas per month. From these data he calculates that the gas-burners evolve enough carbonic acid each night to contaminate the air-space used by three hundred and thirty patients. Of course, with good ventilation, this passes off. Gas-burners can be easily ventilated by a tin funnel placed about three feet above them, and a tube communicating with the ventilating flue. The whole ventilation of the room is also increased by the upward current thus established.

Other and very simple means have been found of warming hospital pavilions, by having stoves under the floors, in an enclosed basement, and allowing the cold air to come in through a large air-box, to be tempered by the stoves, and then to enter the ward through very numerous and minute openings in the floor.

Practically, it is found that the pavilion and ridge ventilating system works admirably in a hygienic point of view. Zymotic diseases are rare, and infection does not extend. During two months of the hottest weather, in a hospital of five hundred beds, to which we were attached, filled and refilled several times with acute cases, chiefly of wounded men, there were but three cases of erysipelas and two of hospital gangrene.

There are now fully two hundred and twenty-five general hospitals in the United States. Many of them are recent structures, on these improved plans. Many, also, are of immense size. It was estimated in 1862, from satisfactory

data, that they contained nearly eighty thousand patients. From the "Consolidated Report of Gunshot Wounds," just issued from the Surgeon-General's office, it appears that during only *four months* of 1862 there were received and treated 20,930 cases of gunshot wounds. The wounded of the whole British army during the entire Crimean war amounted only to a little over twelve thousand; and it has been well remarked, that their entire hospital accommodations during those three years would not have sufficed for the reception of the wounded of either of the battles of Shiloh, Antietam, or Gettysburg. Such vast requirements may surely excuse some defects in this great system of hospitals.

Thus far we have seen that admirable accommodations are provided for the sick or wounded soldier. Brought from the camp or field to the General Hospital, he finds himself placed in a light, airy ward, almost as well ventilated as if in the open air to which he has been accustomed, well warmed and lighted, and is finally deposited, after a bath, in a clean bed. Surely these are no slight luxuries to a weary, wounded man. But these are not all. He must be fed, nursed, doctored, and withal kept under a wholesome restraint and discipline. In a military hospital things must go by rule. The soldier is not a civilian. He is used to obey, not to enjoy freedom without license. Discipline is absolutely essential to his well-being, and to the proper conduct of a great hospital. All our rank and file, too, are not heroes and saints. Certain Eastern regiments, recruited in localities where popular opinion is so strong that men enlist from conscientious conviction, are composed of enlightened, and even educated privates. But the great bulk of the Union army is collected from all nationalities and from all motives, and necessarily contains many *mauvais sujéts*, — a fact with which we could not help being impressed on seeing the President, with unwearied kindness, making the rounds of four hundred beds, to say a pleasant word to the sick and wounded, and unconsciously paying the same attention to Corporal Jones, laid up with syphilis, "contracted in the service," and Private Smith, suffering from yesterday's debauch, that he did to the really deserving.

For a proper understanding, it will be best to review the

military administration of hospitals. In some respects, we regard it as superior to the administration of civil hospitals. Among these is the system of inspection which is carried on daily, nightly, and weekly. The medical officers, as in other hospitals, make two daily visits to the wards, a long dressing and prescribing visit in the morning, and a shorter general visit in the evening. In addition to this, the medical "officer of the day" makes two visits of inspection, — one in the middle of the day, when he views the whole house, the kitchens, store-rooms, dispensary, nurses' rooms, sculleries, and water-closets, as well as the wards, their cleanliness, ventilation, order, the state of the beds, and all necessary details, — the other after midnight, when he again visits the whole house, sees that everything is safe from fire, and the watchers awake, and attends to the wants of the sick who are sleepless. The latter we regard as a very admirable feature in the medical administration. By it the sick are insured a third diurnal visit. For ourselves, we never went this nightly round without finding something to do for the patients, for lack of which they would have suffered, — an opiate to be given, a stump to be wet, or a fracture adjusted into some easier position. In addition to this, there is a weekly "general inspection" on Sunday, by the surgeon in charge, accompanied by the whole medical staff and the hospital stewards. This is very minute, lasting several hours in a large hospital. Every nook and corner is pried into ; cooking-utensils are overhauled, dishes inspected, beds tipped up and searched, and the drainage and filth especially looked after, outside and in. Complaints are also heard, and abuses or negligences noted for redress. Under this thorough system of inspection, it is impossible that any great evils or deficiencies can go long overlooked. If neglected in the daily, they will be discovered in the weekly rounds.

Other military rules are not so praiseworthy. Among the greater evils, we regard the mixed duties of the surgeon in charge, and also of his assistants. They have too many mere executive functions added to their professional labors. The assistant-surgeon has every three or four days to be "officer of the day," when he must be temporary military governor of

the whole institution for twenty-four hours, besides attending to his wards. The surgeon in charge has always more administrative than medical duties. He cannot properly take care of the sick in addition to carrying on a great hospital, but must leave all but a superficial oversight of the worst cases to his assistants. For this reason we think that there should be two head officers of a large general hospital, — one executive and military, the other medical. This evil, too, increases as the surgeon rises in rank, so that the surgeon of a brigade, much more the medical director of a division, is engrossed in administrative details of the most laborious nature. His age and experience in the service are thus in great measure lost to the sick, and frittered away in official details. Thus it is a common saying among the volunteer medical corps, that the best way to see practice is to be a simple assistant-surgeon. The medical regulations of the army are humane and reasonable, but they are also exacting and rigid. Admirably adapted to the perfect care of the regimental and general hospitals of an army of fifteen thousand men, as ours was before this war, they perhaps need more elasticity to adapt them to the vast wants of the service now. Then the higher grades of the medical staff could discharge both official and professional duties; now they must be absorbed in one class only.

The food provided for the sick soldier is excellent in quality, and most abundant in quantity. It is known that the soldier in health cannot consume all his rations; they are more than enough. Much more must the sick have a surplus. Thus five hundred men in hospital, entitled to five hundred daily rations, may not need more than two hundred. But being entitled to all, they are allowed to commute what they do not use, at a fixed rate, and to purchase articles more suitable for the sick. This commutation of rations is properly managed by the hospital steward, under the eye of the surgeon in charge. The money thus saved forms what is called the hospital fund, with which luxuries are bought for the patients, — such as fruit, ice, and all little delicacies, — the government finding wines and stimulants. Thus, in the hospital with which we are best acquainted, the fund sometimes amounted to one thousand dollars a month. With this, thirty dozen of

eggs, a keg of butter, several boxes of lemons, and large quantities of ice, with other commodities, were bought and used every day. When, therefore, complaint is made that the sick of any government hospital, established long enough to accumulate a hospital fund, are not provided with luxuries, it must be either because the hospital steward is a thief, or the surgeon in charge incompetent, or perhaps both. With the diet, or the lesser delicacies of the sick, the medical staff have nothing to do, since the officers are required to mess at their own expense. Close at hand, to supply any deficiencies of little luxuries, old linen, bandages, and the like, is the Sanitary Commission. And all this is without counting the not always judicious gifts of friends and visitors.

By the "Diet Table for General Hospitals, U. S. Army," it appears how abundant the food is. The convalescent on "full diet" receives meat five times a week, and fish once; on the seventh day, he has pork and beans; sixteen ounces of fresh beef or mutton on four days; the same quantity of corned-beef on the fifth; bread, sixteen ounces daily; potatoes and other vegetables daily; coffee and tea, milk, sugar, and rice or hominy daily, with flour, molasses, vinegar, salt, and pickles. "Half diet" consists of the same, in smaller quantity; low diet, of fresh meat, bread and butter, tea, and rice or farina; chicken diet, of fowl, bread, and tea; milk diet, of milk, bread, and rice; beef-tea diet, of beef-tea, bread, and tea. Besides this, there is a long list of extras, to be furnished by the Medical Purveyor, if required, such as chocolate, gelatine, tapioca, porter, wine, and brandy. There is no reason, in a permanent general hospital, why the sick soldier should not be abundantly and appropriately nourished. In the field and regimental hospitals, particularly if the army is in motion, many deficiencies must occur. We know that when, on the evacuation of Yorktown, several hundred of McLellan's army were left behind, mostly ill with typhoid fever, the only nourishment that could be procured for them, for days, was the ordinary tough corned-beef, and "hard-tack," or hard biscuit; and there were not enough cooking utensils to prepare that.

Scarcely less important to the sick man is the cooking of

his food. This, we fear, is generally poor. What fell under our personal observation was execrable. The reason was plain enough, but the remedy very difficult. Professional cooks are the great desideratum. Government provides extra pay for a certain number of convalescents, enlisted men, to serve as cooks, as hospital attendants, and in other capacities. The "Regulations for the Medical Department of the Army" provide for a general hospital, one steward, one ward-master, one nurse to ten patients, one matron, or higher nurse, to twenty, and one cook to thirty. These numbers are varied with some latitude; but the quality is necessarily poor. Much waste, delay, and bad cooking result. It would be cheaper for the government, in our opinion, to let out the cooking of each large hospital to some competent matron or professional cook. Certainly, where ample means are provided to cook with, the sick soldier in a permanent hospital might, or ought to, have his plain meals as good and as unvarying as at a restaurant or hotel. In Washington we found the soft bread from the Capitol bakery uniformly good, and it was furnished to all the hospitals daily. But the coffee, tea, soup, and other regular dishes, were generally poor, and sometimes unfit for use. How far this may be remedied now, we cannot say; but while the same causes exist, it must continue, at best, uncertain. This is a very serious evil to the sick or wounded man, who needs the best of nourishment.

For similar reasons, the nursing is not of the best quality. Nurses are provided by the regulations from privates, and a certain number of hired females. A ward of twenty beds would have two male nurses, and one matron, or head-nurse. In many cases the male nurses are convalescents, not strong enough to return to duty. Many of these are men of *bon volonté*, really kind, and desirous to tend carefully their sick comrades. A few are natural nurses, dexterous, quick, quiet, watchful; many are clumsy, slow, and dull. The female nurses are pretty good. But a lady who goes to an army hospital to nurse the soldiers finds herself in a very anomalous, and sometimes unpleasant position. As Miss Nightingale says, she should always be at the head, and never have to perform menial offices; not that they are degrading, but her prestige must be

preserved in the eyes of inferior, hired nurses. In no recognized place, where everything goes by rank, she is often put in a false position in consequence. Invalid soldiers are obviously improper for the weary task of nursing the sick. How often have we had to rouse and reprimand the tired watcher, who had been transferred from a sick-bed to be the night-nurse of his feebler comrades! At one time, hired professional male nurses were procured for some of the general hospitals from the large cities. Those whom we saw were a poor set, — decrepit and superannuated hospital attendants, or rascals who had lost their places. Many drank and smuggled in liquor to the patients. We think that one typhoid patient died in consequence of a debauch thus induced. A few of these nurses were good; and in other hospitals they may have been better, but we doubt it. Those hospitals which were so fortunate as to secure the services of the Sisters of Charity were well administered. Admirable nurses, good cooks, and always patient, quiet women, they discharged all the duties of the ward and the kitchen faithfully and well; and what was of equal importance, they had a recognized head, or superior, by whom they were governed, and whose word was law. The advantage of this to the medical officer is incalculable.

The medicines furnished to the sick are of the best quality. They pass through the hands of a medical purveyor, and their amount is regulated by a supply table. The dispensing of drugs, in all hospitals large enough to have a hospital steward devoted to that duty, is well attended to. The supply of stimulants is liberal, and that of all surgical appliances and of surgical instruments abundant.

It is more difficult to speak with justice of the medical officers, their duties, and their mode of performing them. The position is an arduous one.

"To obtain the utmost degree of good from such hospitals, it is necessary, as in everything else, that the best medical officers should be placed in charge of them, — men who not only know their duty, but who are possessed of the requisite administrative ability to carry out the measures which their judgment dictates. Something more is needed than mere professional knowledge; an association with military men, and the acquirement of the habit of commanding, are indispensable.

Some persons gain the power quickly, others never acquire it. It is an error, therefore, to suppose that, because a medical man is a good practitioner, or an accomplished teacher, he is at once qualified to assume the charge of a military hospital. Accustomed to practise in a city, with every convenience at hand, civil physicians and surgeons are often lost when they are thrown upon their own resources; and, knowing nothing of the exigencies of a military life, are indignant when the purveyors express themselves unable to comply with their demands. The business of a military surgeon must be learned, like every other; but in times like these the scholars are apt, and vie with each other in their efforts to render themselves useful." — p. 398.

So says the Surgeon-General. We may add, that many of the acting assistant-surgeons are young, and some are recent graduates. Thrown very much on their own resources, they are also often overworked with professional and executive details. In a large hospital, particularly if there has been an engagement within a few weeks, the assistant-surgeon must spend the whole forenoon in his ward, engrossed in the most exhaustive labors over the wounded, where the heat and the unavoidably depressing agency of so many suppurating wounds combine to fatigue him to the limits of endurance. The hours after dinner must be devoted to the performance of any operations demanded; for then only can the whole medical staff be present. In the evening there is another visit, and new cases to be attended to, which have come in during the day. Besides these, there are military duties. Every two or three days, as officer of the day, he must devote an hour or two to inspecting the house, flushing every water-closet, overlooking beds, wards, and medicines, looking into the kitchen-utensils, tasting the soup, and endless other minutiæ, and must also be at the beck and call of every complainant, and the judge and punisher of every infraction of discipline. He must, besides, receive and conduct visitors, and answer innumerable questions. Weary as he may be, he must still go the "grand rounds" after midnight, through every ward, and outside, around the guard. At two o'clock in the morning he at last goes to bed, to be roused possibly by a convoy of ambulances, bringing in fifty or a hundred dusty, tired, hungry, sick, and ghastly wretches, to whom the remainder of the night must, for humanity's sake,

be devoted. Of all this he has no right to complain. It is only cited to show that his short-comings are to be regarded with some leniency. At the same time, it is not to be denied that there are some who are indolent, indifferent, or worse. Such exist in every branch of the profession. We are glad to learn that, in the judgment of Dr. Ellis, who was lately in charge at White-House on the Peninsula, the medical corps in the field has much improved in quality since the commencement of the war.

The persistent but mistaken kindness of the public, chiefly female, in striving to see, nurse, and feed the sick in the hospitals, who are seen, nursed, and fed besides by the regular attendants, is one of the chief sources of annoyance to the medical officer, and of injury to the sick. Eight hundred visitors entered the hospital to which we were attached on one afternoon. The soldiers even complained that they could have no privacy for their sick needs. Restrained to two afternoons a week, these Samaritans were indignant, and tried to smuggle themselves and their little offerings in unseen. Their lavish attentions were destructive of discipline, and thwarted the surgeon's best efforts. One good lady was detected hiding doughnuts beneath every patient's pillow, in a ward of fever patients. Comment is useless.

The surgeons are often accused of needlessly amputating limbs, and performing other operations. But it has seemed to us that there is a large class of cases where life is ultimately lost through too great conservatism. When we consider the many perils to which the long recovery from a shattered limb exposes the private soldier, of bad transportation, hospital diseases, and malaria, — and all these supervening on a feeble state of the blood, as we shall presently describe, — we may well hesitate to submit him to such risks, which an amputation will, to a considerable extent, avert.

The habits of the soldier are, almost unavoidably, somewhat dirty. Removed from the customary conveniences of home, and often so placed as to be able to obtain but a limited supply of poor water for drinking, he inevitably becomes careless and filthy, unless prevented by the strictest discipline. All this operates to engender, communicate, and prolong disease.

Moreover, his constitutional state after a campaign, when he enters a hospital, is low. In our own experience, a thin and probably scorbutic condition of the blood was noticeable in the majority of wounded men. Robust health, suddenly stricken down by a wound, was an exceptional appearance. There was no strong reaction after injury. The aspect was that of fatigue. Convalescence was slow and lingering, the patient not recovering a rosy color, or the look of firm health. All the cases here alluded to came from the Peninsula, after the siege of Yorktown and the sojourn in the pestilent swamps of the Chickahominy. Climate, fatigue, exposure, want of sleep, and, above all, too little and poorly prepared food, and food of a bad quality, with no margin of extras to revive the appetite or enrich the blood, — all this supervening on habits of ease and plenty, and continuing to act on yielding constitutions for months, had gradually undermined the strength, and led to the state of prostration just described. Such a condition of things is perhaps inseparable from war. Exactly similar accounts may be found in all military writers. Many of these men came in with the prostration of typhoid, apparently. They slept, and slept for day after day, and arose well. They had no disease but sheer fatigue. Now all these conditions must be taken into account in estimating the salubrity of our army hospitals. Equally must the character of the cooking, nursing, and medical attendance be noted, in making our estimate of their efficiency; and for this reason we have alluded to them at such length.

The Surgeon-General closes the part of his book relating to hospitals by a chapter on field hospitals, in which he proves that tents form very excellent sick-wards, — far better than any but first-class hospitals, — provided they are trenched, kept clean, ventilated, and not overcrowded. He allows but six, or at most eight, men to a regulation hospital-tent. This tent is fifteen feet square, and eleven feet high at the ridge. It has perpendicular walls, and a false roof, or "fly," to keep off the sun. Three such tents, one Sibley tent, and one common tent, are allowed to a regiment. It has long been noticed that wounded men do extremely well in tents, even in severe weather.

In speaking of camps, Dr. Hammond says that the interior of tents should never be excavated. They must be under strict police, with regard to latrines, slaughter and cooking places, and all rubbish. The tents should be struck every few days, and the ground beneath them sunned and aired. Thus camp diseases, as typhus, may be avoided. Very much depends upon the knowledge of the medical officer in selecting the site for a camping-ground, as to its salubrity. Comparisons are drawn from the density of various towns and cities, as to the proper density of an encamped population of equal numbers. The regulation camp gives a density of 86,448 to the square mile; while London has but 50,000, Birmingham 40,000, and Philadelphia 45,000 to the same area. This is obviously wrong.

We are sorry that want of space forbids our touching upon the very interesting chapters on food, considered physiologically, and the alimentation and clothing of the soldier. Their contents are interesting, the experiments extensive, and the results important.

In taking leave of our author, we cannot help feeling that the elective *faux pas* which placed him where he is, in total disregard of all just and established rules of precedence, was, on the whole, beneficial in its results. Many of the gentlemen who were his seniors would doubtless have equally well filled his position, as we know some of them to have nobly discharged no less arduous duties of inspection and administration since the war began. Yet, as representing the young school of medicine and science, and, above all, as a believer and practiser of hygiene more than of drugs, we regard him as well qualified for his place at the head of the medical corps. He pays frequent tributes to that Commission appointed by her Majesty to report on the evils of hospitals in the Crimean war, to which America as well as England owes much of the improvement in the care of the soldier, both in health and in sickness. Nor is he disposed to deprive the accomplished surgeons and assistant surgeons of the regular army of the part they have performed in planning, erecting, and carrying on the immense and noble hospitals we have described.

Considerable discussion has been excited, both within the

profession and without, by the Surgeon-General's order excluding calomel and tartar-emetic from the supply-table of the army. We are inclined to think that the mere loss of these medicaments is of little importance to the soldier. But we deeply regret that disgraceful malpractice of a portion of the medical service which necessitated the issuing of such a restriction.

If our author sometimes displays mistakes in pathology, which prove his mind to have been occupied in scientific research somewhat to the exclusion of practice, yet we must admire the perseverance and fortitude which have led him to experiment upon himself physiologically, concerning food and other agents, at the expense of very considerable physical suffering and prostration. It is especially on account of this direction of his mind toward the new and great truths of chemistry, physiology, ventilation, light, food, and kindred subjects, that we think it fortunate for the army and the country that he occupies the position he does, at this critical juncture of affairs; for the improvements in the sanitary state of camps and hospitals must be partly ascribed to his influence, as well as to that of the noble Sanitary Commission, and to the progress in public opinion.

Already this unhappy war has furnished to the medical profession experience and statistics larger than the world ever saw before. A Military Museum established in Washington already contains more pathological specimens of gun-shot wounds than almost any in the Old World, and this is designed to be the nucleus of a military medical school. Even at the risk of regarding this question in too professional a spirit, let us look at that principle of compensation which brings some good out of every evil; and which may cause the present strife to result in the progress of humanity and the advancement of science, as well as in that of liberty, and in the restored Union of our common country.